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भारतीय मानक

चुंबकीय दोष निकालने की स्याही और पाउडर — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

MAGNETIC FLAW DETECTION INKS AND POWDERS — SPECIFICATION

(Second Revision)

ICS 77.040.20

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Non-destructive Testing Sectional Committee, MTD 21

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Non-destructive Testing Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1971 and subsequently revised in 1991. While reviewing this standard in the light of experience gained during these years, the Committee decided to revise this standard. While revising this standard International practices have been duly considered along with Indian scenario.

In this revision following modifications have been made:

a) Some of the values that is settlement volumes, ultraviolet light intensity, etc, have been changed according to latest practices being followed in the country.
b) Points like compositions of powders and marking on containers are made comprehensive and specific.
c) New functional tests have been added keeping in view the current international practices.
d) Detailed figures are added, whereever necessary for better understanding.

In the formulation of this standard, assistance has been derived from the following publications:

ISO 9934-2 : 2002 'Non-destructive testing — Magnetic particle testing — Part 2: Detection media', issued by the International Organization for Standardization

ASTM A 275/A 275M-07 'Standard method for magnetic particle examination of steel forgings', issued by the American Society of Testing Metals, USA

ASTM E 709-08 'Standard guide for magnetic particle testing', issued by the American Society of Testing Metals, USA

ASTM E 1444-05 'Standard practice for magnetic particle testing', issued by the American Society of Testing Metals, USA

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

MAGNETIC FLAW DETECTION INKS AND POWDERS — SPECIFICATION

(Second Revision)

1 SCOPE

This standard specifies the requirements for non-fluorescent and fluorescent inks, concentrates and powders used in magnetic flaw detection techniques.

2 REFERENCES

The following standards contain provisions which through reference in the text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
460 (Part 1) : 1985	Specification for test sieves: Part 1 Wire cloth test sieves (*third re*vision)
1448 (Part 25) : 1976	Methods of test for petroleum and its products: Part 25 Determination of kinematic and dynamic viscosity (*first revision*)
3415 : 1980	Glossary of terms used in magnetic particle flaw detection (*second revision*)

3 TERMINOLOGY

For the purpose of this standard, definitions given in IS 3415 shall apply.

4 DESCRIPTION

4.1 Magnetic Inks

4.1.1 Non-fluorescent and fluorescent inks, whether supplied ready for use or made up from concentrates, shall consist essentially of finely divided ferromagnetic particles and a suitable carrier liquid. They shall form a uniform suspension when agitated. Certain other ingredients, in the proportion specified in **5**, may be present at the option of the manufacturer.

4.1.2 Inks shall not contain any ingredients that are generally recognized or known to cause injury or discomfort to operators during or after use.

4.1.3 Inks shall not corrode or otherwise adversely affect the surfaces of test parts as specified in Annex A.

4.1.4 The magnetic inks shall meet the requirements of the appropriate tests as specified in **7**.

4.2 Powders

4.2.1 Powders shall consist essentially of finely divided ferromagnetic particles and are of two types:

a) *Type I* — Powders suitable for dry magnetic particle examination (MPE); and
b) *Type II* — Powders suitable for wet magnetic particle examination.

4.2.2 Powders shall not contain any ingredients that are generally recognized or known to cause injury or discomfort to operators during or after use.

4.2.3 Powders shall not corrode or otherwise adversely affect the surfaces of test parts being tested as specified in Annex A.

4.2.4 The powders shall meet the requirements of the appropriate tests specified in **7**.

5 COMPOSITIONS OF INK AND POWDER

5.1 Magnetic Inks

The composition of magnetic inks whether supplied ready to use or prepared from concentrates after diluting with the appropriate carrier fluid in accordance with the manufacturers' instructions shall in all respects comply with the following requirements.

5.1.1 *Solid Content (Including Adherent Non-magnetic Pigments)*

5.1.1.1 *Non-fluorescent inks*

In ready to use condition shall have a particle concentration of 1.2 to 2.4 percent volume/volume, as determined by the procedure given in Annex B.

5.1.1.2 *Fluorescent inks*

In ready to use condition shall have a particle concentration of 0.1 to 0.4 percent (*v*/*v*), as determined by the procedure given in Annex B.

5.1.2 *Other Constituents and Soluble Additives*

Not more than 10 percent of the ferromagnetic particles (including adherent non-magnetic pigment) at the discretion of the manufacturer.

5.1.3 *Carrier Fluid*

The remainder.

5.2 Powders

The composition of magnetic powders shall be as follows:

a) Ferromagnetic particles (including adherent non-magnetic pigments)
   1) *For Type I (dry MPE)*—not less than 95 percent by weight; and
   2) *For Type II (wet MPE)*—not less than 75 percent by weight.
b) *Other constituents*—The remainder.

6 MATERIALS

6.1 Ferromagnetic Particles and Other Solid Ingredients

6.1.1 *Particle Size*

a) *Type I for dry application*—Ferromagnetic particles having particle size between 40 and 200 micron with average particle size of 100 micron are used for visible dry magnetic particle examination.
b) *Type II for wet application*—Ferromagnetic particles having average particle of 20 micron are used for visible wet magnetic particle examination. For fluorescent wet magnetic particle examination average particle size shall be 5 micron.

Particle size determination may be done by sieving the particles through appropriate sieves as per IS 460 (Part 1) or by any other suitable method as agreed between the manufacturer and the user.

6.1.2 *Colour*

Particles for dry examination (Type I) are usually grey, black or red in colour. Non-fluorescent particles (Type II) for wet examination are black, brown or red in colour when viewed in day light and fluorescent particles (Type II) are bright yellow, green or orange when viewed in black light.

6.2 Carrier Fluid

6.2.1 The carrier fluid used in preparing the bath shall be either water (preferably demineralized water) or well-refined petroleum distillate having low sulphur, chlorine (halogen) and moisture content. The carrier fluid should be free from fluorescence and contaminants which will quench the fluorescence of fluorescent magnetic particles.

6.2.2 In the case of water as carrier liquid, it is recommended to use water conditioners containing wetting, anti-corrosive, anti-foaming and dispersing agents and in ready to use condition must pass the water break test as specified in Annex C. The *p*H of the same should be between 7 and 10.

6.2.3 In the case of petroleum distillate, the recommended characteristics are:

a) The fluid should be almost colourless and should not possess any unpleasant odour;
b) Viscosity should be 3 cSt at 38°C and not more than 5 cSt at operating temperature when tested in accordance with IS 1448 (Part 25);
c) Minimum flash point of the fluid when measured by Pensky Martens Open cup should be 93°C (366 K) or the flash point can be as agreed between manufacturer and user; and
d) Boiling range of fluid should be between 200°C to 260°C (473K-533K) or as agreed between the manufacturer and the user.

6.2.4 Use of any other carrier fluid shall be with mutual agreement of user and manufacturer/supplier.

7 TESTING OF INKS, POWDERS AND BATH

Magnetic inks, powder and bath either new or in use, when subjected to different tests as per details given in Annexes A, B, D, E, and F shall be considered acceptable, if the result of the test meets its corresponding acceptance criteria given in **7.1**, **7.2** and **7.3**. All examinations for fluorescent particles shall be carried out using black light (wavelength 3 650 Å, Peak) having minimum intensity of 1 000 $\mu W/cm^2$ at the surface of examination. The ambient lighting should not be more than 20 lux.

7.1 Magnetic Inks

7.1.1 Magnetic inks are required to be tested in ready to use condition and hence the inks, if supplied in concentrated form are diluted as recommended by the manufacturer prior to testing.

7.1.2 *Solid Content*

When tested in accordance with the method given in Annex B, the solid contents by volume shall be as indicated below:

a) *Non-fluorescent ink* : 1.2 percent to 2.4 percent
b) *Fluorescent ink* : 0.1 percent to 0.4 percent

In case of special test (*see* **B-1.3**), applicable only for fluorescent magnetic particles, the supernatant liquid shall not exhibit excessive fluorescence.

7.1.3 *Functional Test*

When the ink is tested in accordance with method

described in Annex D, the artificial defects perpendicular to the magnetic field should be clearly visible in continuous outline. The acceptance criteria for artificially produced defect specimens are indicated under each test (*see* Annex D) or may mutually be agreed by the user and the supplier.

7.1.4 *Ferromagnetic Particle Content*

When the ink is tested in accordance with the method described in Annex E, the amount of ferromagnetic particles shall not be less than 75 percent by weight of the total solid content.

7.1.5 *Corrosion Test*

When ink is tested in accordance with the method described in Annex A, the steel bar shall not exhibit any evidence of corrosion or chemical attack.

7.1.6 *Test for Residual Magnetism*

When ink is tested in accordance with the method described in Annex F, ink shall not retain any residual magnetism.

7.2 Magnetic Powders

7.2.1 Type I powders are tested directly as supplied where as Type II powders are diluted in the carrier fluid as per the recommendation of the manufacturer and tested.

7.2.2 *Solid Content*

Test given in Annex B is applicable to Type II powders only and the solid content requirements shall be as per **7.1.2**.

7.2.3 *Functional Test*

When (Type I and Type II) magnetic powders are tested in accordance with the method given in Annex D, the artificial defects perpendicular to the direction of magnetic field should be clearly visible. The acceptance criteria may be mutually agreed between the user and the supplier or as indicated in Annex D.

7.2.4 *Ferromagnetic Particle Content*

When magnetic powders (Type I and Type II) are tested in accordance with the method described in Annex E, the amount of ferromagnetic particles shall not be less than 95 percent by weight of the total solid content.

7.2.5 *Corrosion Test*

When magnetic powders (Type I and Type II) are tested in accordance with the method described in Annex A, the steel bar shall not exhibit any evidence of corrosion or chemical attack.

7.2.6 *Test for Residual Magnetism*

When magnetic powders are tested in accordance with the method described in Annex F, powders shall not retain any residual magnetism.

7.3 Bath

Bath prepared for wet magnetic particle examination, may be periodically checked for suitability by various tests as per Annexes A, B, D, E and F. Crack pattern on the pre-magnetized disc of **D-2.4** provides an effective way to compare the condition of the used bath with that of fresh bath. In addition to above tests, bath prepared by using conditioned water as carrier fluid may be subjected to water break test specified in Annex C. Depending upon the condition, bath may be discarded or replenished as the case may be.

8 LABELLING

Supplier must clearly indicate the following minimum parameters on the container label:

a)	Name of the item	: Magnetic powder/magnetic ink and colour (ready to use as supplied or concentrate);
b)	Nature of magnetic particles	: Fluorescent or non-fluorescent;
c)	Intended use	: Dry or wet application;
d)	Batch No.	: Number representing the batch;
e)	Manufacturing date	: Date/Month/Year;
f)	Expiry date	: Date/Month/Year;
g)	Details of carrier fluid	: Type of carrier fluid to be used for Type II particles and recommended dilution; and
h)	Caution/fire symbols	: Wherever necessary.

ANNEX A

(*Clauses* 4.1.3, 4.2.3, 7, 7.1.5, 7.2.5 *and* 7.3)

CORROSION TEST

A-1 PROCEDURE

A machined bar of low carbon steel of approximately 150 mm long and not less than 12.5 mm in diameter having a smooth surface texture shall be immersed partially in a sample of the ink or powder for not less than 12 h.

A-2 EXAMINATION AND ACCEPTANCE

At the end of 12 h period, the surface of the bar shall be examined visually. If there is no sign of corrosion on the surface of the bar, ink or powder shall be acceptable.

ANNEX B

(*Clauses* 5.1.1.1, 5.1.1.2, 7, 7.1.2, 7.2.2 *and* 7.3)

DETERMINATION OF SOLID CONTENT OF MAGNETIC INK AND POWDER

B-1 PROCEDURE FOR SOLID CONTENT

B-1.1 Concentrated inks or powders (Type II) intended to be used for wet particle examination are diluted with recommended carrier fluid as per manufacturer's recommended concentration. Immediately after thoroughly mixing, 100 ml sample is collected into a vertically supported 100 ml centrifuge tube as shown in Fig. 1. The sample is allowed to settle, for at least 30 min. until the apparent line of demarcation between solids and liquid has attained a constant level. Read the level reached by the solids and record this as the solid content by volume.

B-1.2 For powders and inks already in use, mix the bath thoroughly and transfer 100 ml sample to centrifuge tube and find out solid content as per **B-1.1**.

B-1.3 Special Test for Fluorescent Magnetic Particles

While carrying out the test for solid content in fluorescent magnetic particles as per **B-1.1** and **B-1.2**, observe the supernatant liquid under black light. Supernatant liquid should be free from fluorescence as far as possible (slight fluorescence may be permitted). In case of excessive fluorescence of supernatant liquid, the product may not be acceptable or in the case of ink in service, it should be discarded.

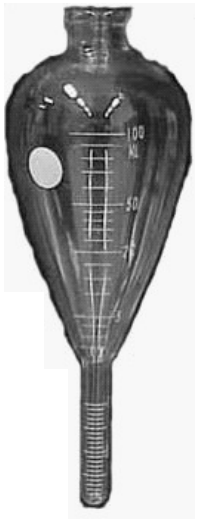


FIG. 1 CENTRIFUGE TUBE FILLED WITH INK

ANNEX C
(*Clauses* 6.2.2 *and* 7.3)

WATER BREAK TEST FOR CONDITIONED WATER USED AS CARRIER FLUID

C-1 PROCEDURE

Water conditioner is diluted as per manufacturer's recommendation and a clean part with a surface finish same as the part under test is flooded with the conditioned water and the appearance of the surface is observed for continuous film.

C-2 EXAMINATION AND ACCEPTANCE

If the water film is continuous, the efficiency of the water conditioner is acceptable; otherwise the concentration of the water conditioner may be altered and the test is repeated so as to obtain continuous film. If the water conditioner does not give continuous film at any concentration, the same should not be used for magnetic particle examination.

ANNEX D
(*Clauses* 7, 7.1.3, 7.2.3 *and* 7.3)

FUNCTIONAL TESTS FOR MAGNETIC INKS AND POWDERS

D-1 USE OF TEST PARTS WITH KNOWN DISCONTINUITIES

A reliable method for the magnetic particle inspection system verification and hence the acceptance of magnetic particles is the use of representative test parts containing known discontinuities of the type and severity normally encountered during actual production. When such test part is used as acceptance standard then the same to be included in the written procedure. After each use, such test part should be thoroughly cleaned and demagnetized to ensure that the indications due to residual magnetism do not remain on the surface of the test part.

D-2 FABRICATED TEST PARTS WITH ARTIFICIAL DISCONTINUITIES

When actual representative test parts containing discontinuities of the type, location and size needed for evaluation are not available or impractical then fabricated test part with artificial discontinuities or commercially available specimens, such as ketos ring, magnetic field indicators (Pie gauge, artificial flaw shims), pre-magnetized disc, etc, may be used for evaluating the performance and sensitivity of the dry or wet magnetic particles.

D-2.1 Test Ring Specimen (Ketos Ring)

D-2.1.1 *Description*

The test ring specimen also known as 'ketos ring' is machined from annealed round stock of tool steel having hardness of 90 to 95 HRB. Ring specimen with overall dimensions of OD 127 mm × ID 31.8 mm × Thickness 22.2 mm contains 12 numbers of through side holes, each of 1.8 mm diameter drilled perpendicular to the flat surfaces and parallel to the curved surface at different depths (*see* Fig. 2).

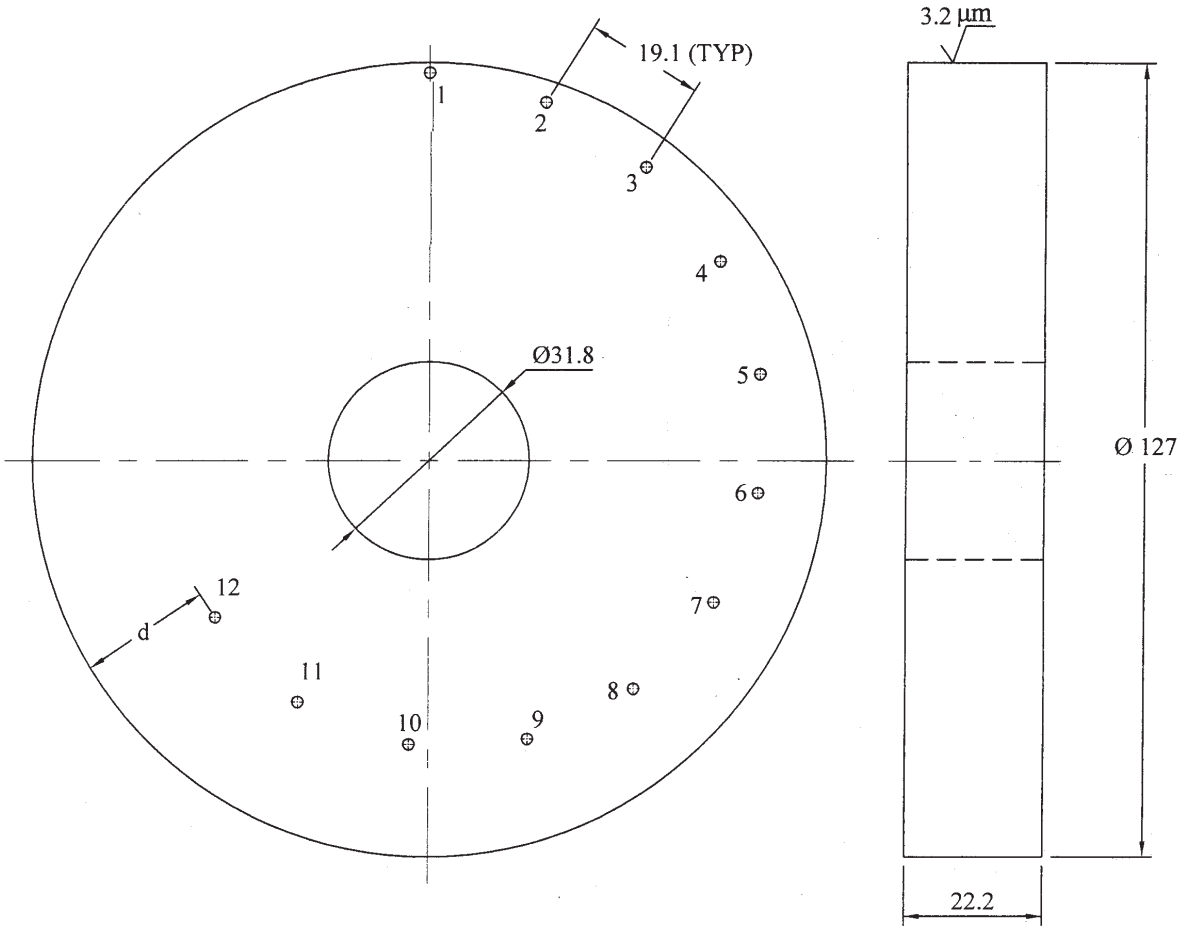
D-2.1.2 *Procedure*

The test ring specimen is used with central conductor magnetization technique. A copper conductor of diameter between 25 and 31 mm and 300 mm length shall be inserted in the central hole of the ketos ring. Place the ring at the centre of the conductor. Different level of circular magnetizations can be obtained inside the ring by passing the current of different values as specified in Table 1, through the central conductor. Apply powders or suspension on the surface of the ring when the current is flowing. Examine the ring within 1 min after the current application, under visible light of not less than 1 000 lux for non-fluorescent particles and black light with intensity not less than 1 000 $\mu W/cm^2$ for fluorescent baths. The number of holes indicated shall be equal or more than those specified in Table 1 for the specified current values and method of testing.

D-2.2 Magnetic Field Indicator — Pie Gauge

D-2.2.1 *Description*

Pie gauge, a magnetic field indicator consists of furnace brazed eight low carbon steel pie sections in the shape of regular octagon with one flat face copper plated (*see* Fig. 3).



NOTES

1 All dimensions in millimetres.

2 Diameter of each hole is 1.8 ± 0.1 mm.

3 Tolerance on all other dimensions is ± 0.8 mm.

4 Holes 10 to 12 are optional.

Distance '*d*'

Hole	1	2	3	4	5	6	7	8	9	10	11	12
d ± 0.1 mm	1.7	3.5	5.3	7.1	8.8	10.6	12.4	14.2	16.0	17.7	19.5	21.3

FIG. 2 TEST RING SPECIMEN (KETOS RING)

Table 1 Different Level of Circular Magnetization

(*Clause* D-2.1.2)

Sl No.	**Method of Testing**	**Central Conductor FWDC**	**Minimum Number of Holes to be Indicated**
(1)	(2)	(3)	(4)
i)	Wet suspension fluorescent or non-fluorescent	1 400 2 500 3 400	3 5 6
ii)	Powders for dry examination	1 400 2 500 3 400	4 6 7

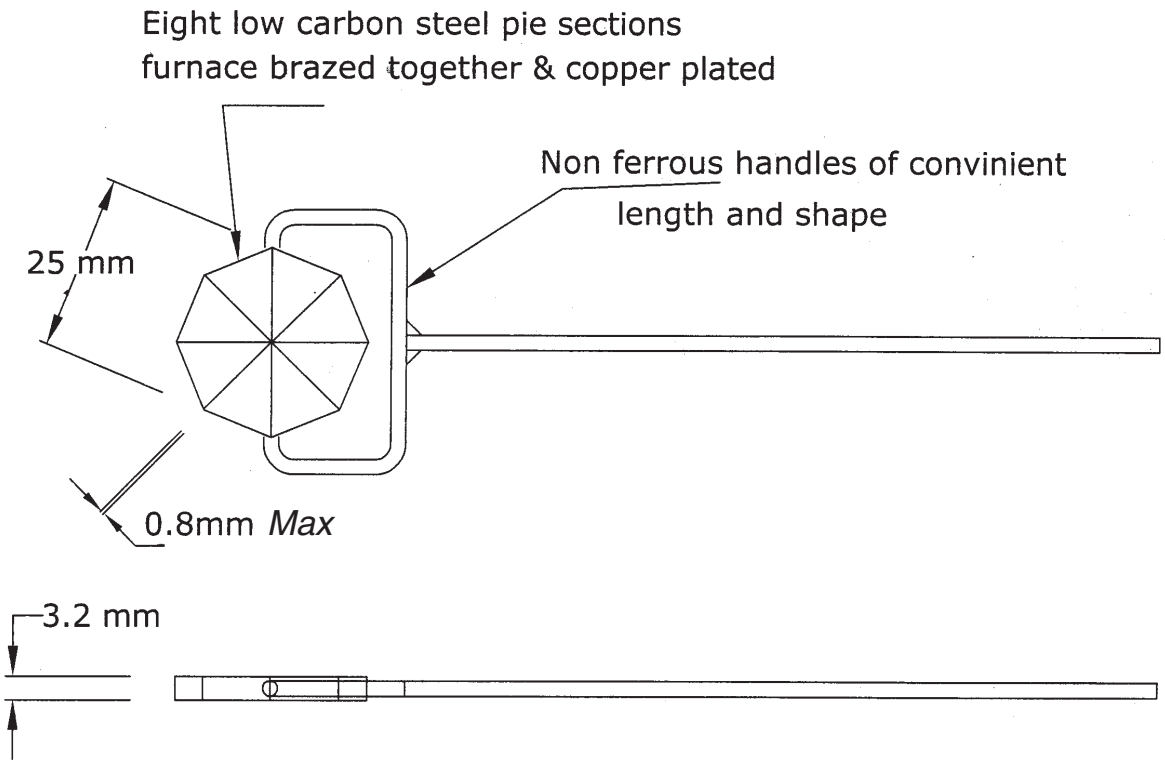


FIG. 3 PIE GAUGE (MAGNETIC FIELD INDICATOR)

D-2.2.2 *Procedure*

Place the pie gauge with the copper side up on the job under test. Spray powder or suspension as the case may be, on the pie gauge when the magnetizing current is on. Inspect for indications formed due to the presence of the slots between the pie shaped segments. Adequacy of the magnetic media along with magnetic field is indicated when clearly defined lines of magnetic particles form above the slots at 90° and 45° to the direction of the magnetic field. Pie type indicator gives best result for Type I (dry) powders.

D-2.3 Magnetic Field Indicator—Artificial Flaw Shims

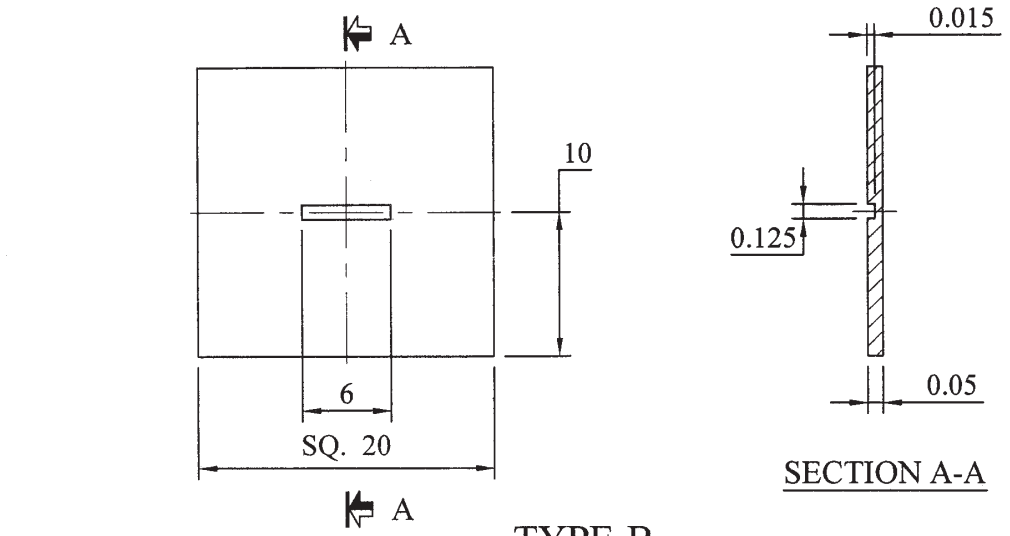
D-2.3.1 *Description*

The artificial flaw shims, also known as Quantitative Quality Indicators (QQI) are used to establish field direction and field strength of magnetic particle examination. They are made of rolled low carbon steel foil with artificial flaw etched or machined on one side.Under Category 1, all shims are of equal thicknesses with flaw having depth equal to 30 percent of the shim thickness (*see* Fig. 4). In Category 2 (*see* Fig. 5), basically there are three types of shims/ QQI: (a) Standard QQI, (b) Variable depth QQI; and (c) Miniature QQI. Under Category 2, shims are available in two thicknesses, 0.05 mm (0.002 in) and 0.10 mm (0.004 in) and two sizes 19 mm (0.75 in) square and 20 mm (0.79 in) square. Thinner shims are used when the thicker shims cannot conform to the part surface in the area of interest. Miniature shims are cut by the user into four 10 mm (0.395 in) square shims for the use in restricted areas.

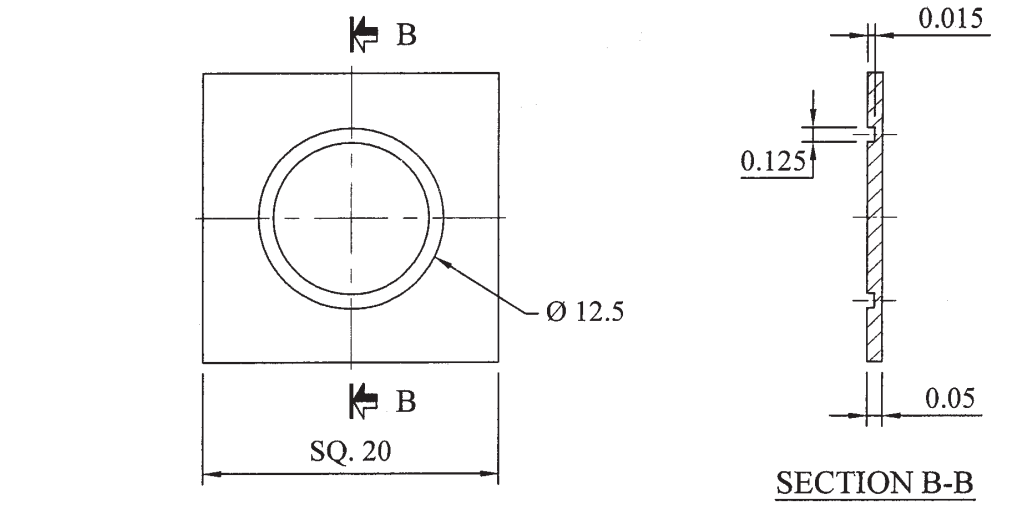
D-2.3.2 *Procedure*

Shims are placed in areas of interest with notches toward the surface of the part being examined. The shims are firmly attached to the test part with tape around the edges to prevent seepage of suspension between shim and the test part. The location of the shims to be fixed is determined by ensuring adequate coverage. Being flexible, shims can match the contour of the part locally. The job is magnetized and ink is sprayed or poured on the shims when the field is on. The artificial discontinuities perpendicular to the direction of magnetic field should show clear, well defined indication.

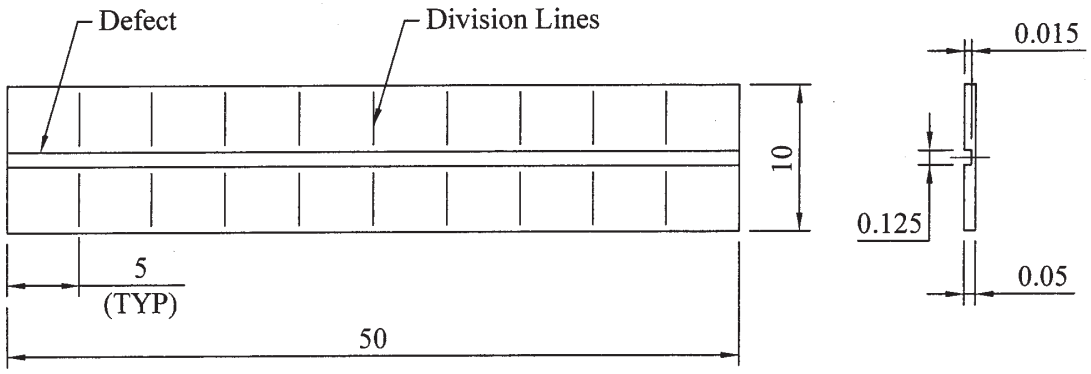
Shims with circular slots may be used to ensure the adequacy and balance of fields in the multidirectional magnetization method. The fields are assumed to be balanced if entire circle on the shim shows indication.



TYPE B



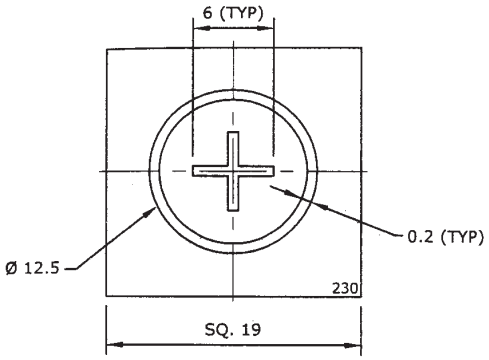
TYPE C



TYPE R

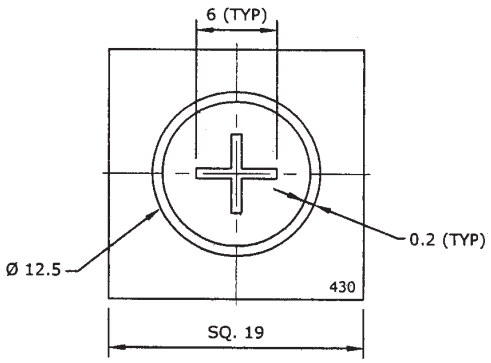
All dimensions in millimetres.

FIG. 4 ARTIFICIAL FLAW SHIMS — CATEGORY 1



Shim Thickness - 0.05 mm (0.002")
Notch Depth - 30% (0.015 mm)

SHIM TYPE CX-230

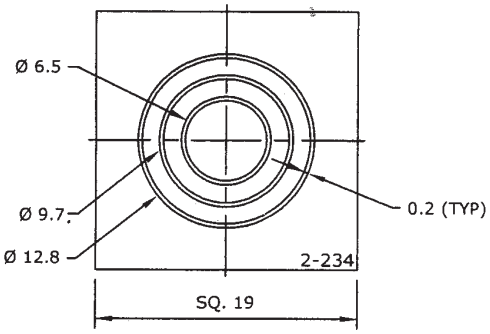


Shim Thickness - 0.10 mm (0.004")
Notch Depth - 30% (0.030 mm)

SHIM TYPE CX-430

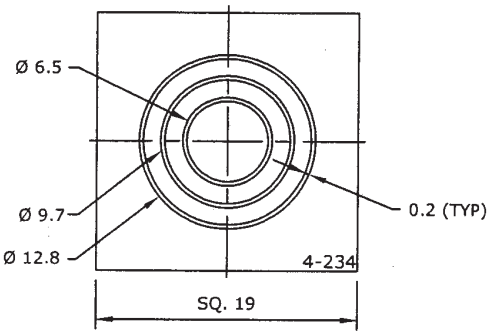
[C-Circular Flaw, X-Crossed Bar Flaw, 2-Shim Thickness in Thou, 30 Depth 30%]

5A Standard QQI



Shim Thickness - 0.05 mm (0.002")
Notch Depth For
Outer Circle - 20% (0.010 mm)
Middle Circle - 30% (0.015 mm)
Inner Circle - 40% (0.020 mm)

SHIM TYPE 3C2-234

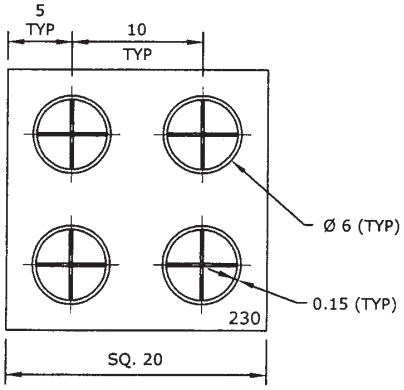


Shim Thickness - 0.10 mm (0.004")
Notch Depth For
Outer Circle - 20% (0.020 mm)
Middle Circle - 30% (0.030 mm)
Inner Circle - 40% (0.040 mm)

SHIM TYPE 3C4-234

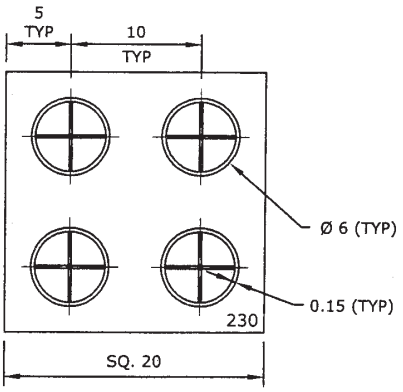
[3C-Three Concentric Circular Flaws, 2-Shim Thickness in Thou, 234-Depth 20%, 30% & 40%]

5B Variable Depth QQI



Shim Thickness - 0.05 mm (0.002")
Notch Depth - 30% (0.015 mm)

SHIM TYPE CX4-230



Shim Thickness - 0.10 mm (0.004")
Notch Depth - 30% (0.030 mm)

SHIM TYPE CX4-430

[CX4-Four Sets of Circular & Crossed Bar Flaws, 2-Shim Thickness in Thou, 30-Depth 30%]

5C Miniature QQI

FIG. 5 ARTIFICIAL FLAW SHIMS — CATEGORY 2

If any portion of the circle has weak indication the amperage is adjusted so as to get balanced magnetic field. Shim type indicators are best used with Type II (wet) magnetic powders.

D-2.4 Pre-magnetized Disc

D-2.4.1 *Description*

Pre-magnetized metal disc, also known as MTU (MAN TURBO MÜNCHEN) Test Block has a specially generated network of fine and coarse cracks on the surface (*see* Fig. 6). Basically it is a quenched cracked permanent magnet and the residual magnetism retained in this piece is used for evaluation and suitability of magnetic particles for residual method of magnetization

D-2.4.2 *Procedure*

Liquid from prepared bath is poured on the piece and the piece is observed in day light or black light as the case may be. The crack pattern should be seen clearly. This test may also be carried out as functional test for magnetic particle bath in use. Reference photograph of the crack pattern obtained with the fresh bath can be compared with that obtained with used bath at any later point of time. If the desired crack pattern is not obtained, then the bath may be suitably replenished or replaced.

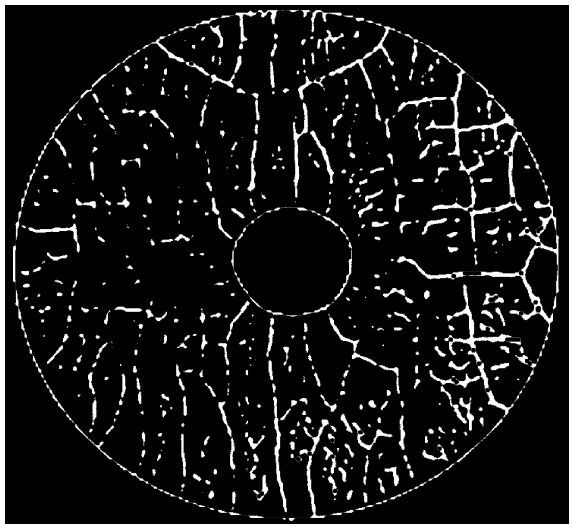


FIG.6 PRE-MAGNETIZED DISC FOR RESIDUAL MAGNETIZATION METHOD

ANNEX E

(*Clauses* 7, 7.1.4, 7.2.4 *and* 7.3)

DETERMINATION OF FERROMAGNETIC PARTICLE CONTENT (INCLUDING ADHERENT NON-MAGNETIC PIGMENTS)

E-1 INKS

Two samples of ink, each of 50 ml are required for this method.

E-1.1 Determination of Weight W_1 of the Non-magnetic Particles

First representative sample of 50 ml of the ink is taken in a large size beaker and this is exposed to the electromagnet or permanent magnet used for magnetic particle examination so that one pole dips into the beaker. While gently agitating the ink with glass rod, the magnet shall be allowed to attract all the magnetic particles from the ink. The above operation is repeated, if required, till no more magnetic particle adheres to the pole. The liquid remaining in the beaker contains only non-magnetic particles as all ferromagnetic particles have been leached out from it with the help of magnet. This leached sample (remaining liquid) is filtered through tared sintered glass crucible (G.No. 4) to obtain all non-magnetic particles as residue. The dry weight W_1 of non-magnetic particles shall be determined by weighing the residue after washing it thoroughly with solvent.

E-1.2 Determination of Weight W_2 of the Total Solids

The dry weight W_2 of the total solids is determined by weighing the residue obtained after filtering the second representative sample of 50 ml of the ink through tared sintered glass crucible (G. No.4).

E-1.3 The Amount of Ferromagnetic Particles W_3

The amount of ferromagnetic particles W_3 is expressed as a percentage of the total W_2 as follows:

$$W_3 = \frac{W_2 - W_1}{W_2} \times 100$$

E-2 POWDERS

Sample of 1 g of powder is required for this method.

E-2.1 One g of powder is taken on to previously weighed flat microscope slide.

E-2.2 Pole of either electromagnet or permanent magnet used for magnetic particle examination is brought close to the heap of the powder, within 1 mm, without touching it. To attract the ferromagnetic particles from the entire sample, either pole or microscope slide should be displaced in horizontal direction relative to each other by approximately 12 mm as shown in Fig. 7. Cycle shall be repeated number of times till all the ferromagnetic particles from the entire sample are collected at the pole.

E-2.3 Determine the weight of the ferromagnetic particles attached to the pole and express as a percentage of the total weight of 1g.

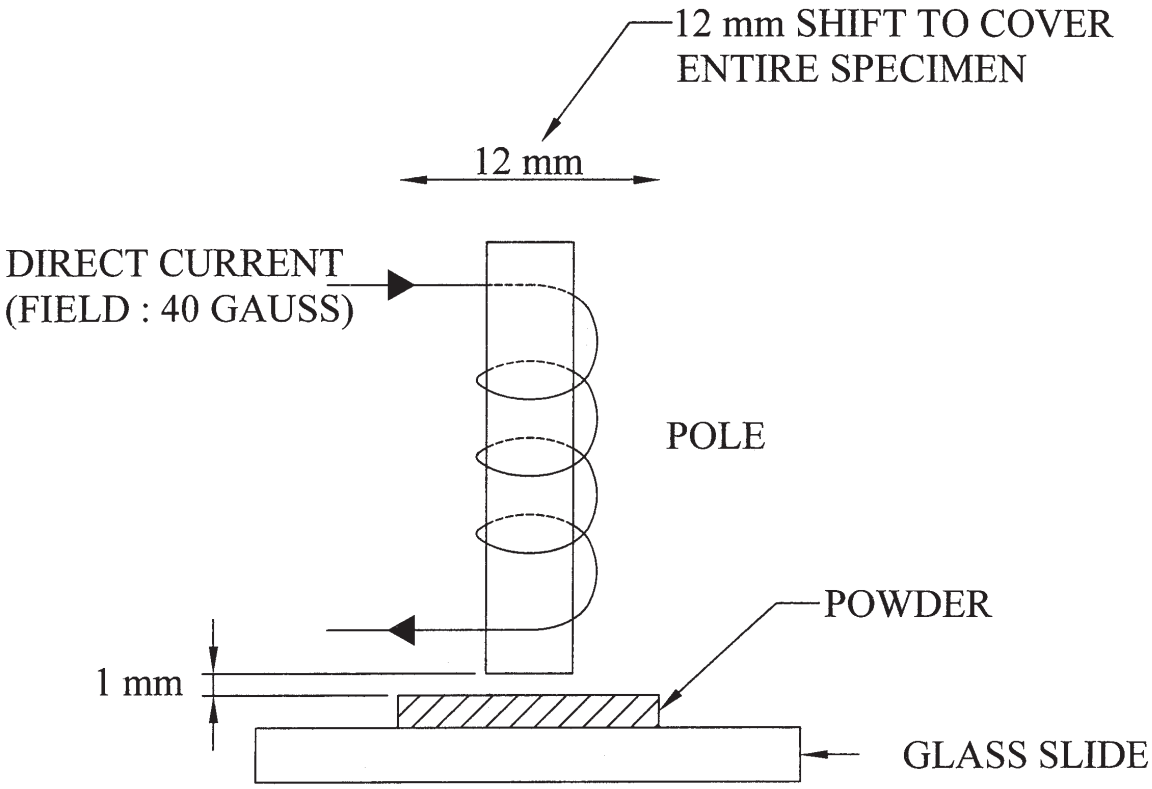


FIG. 7 SET-UP FOR COLLECTING FERROMAGNETIC PARTICLES

ANNEX F

(*Clauses* 7, 7.1.6 *and* 7.2.6)

TEST FOR RESIDUAL MAGNETIC FIELD IN PARTICLES

F-1 PROCEDURE

In case of dry powder a sample of 1g, where as in case of ink/wet bath a sample of 50 ml is subjected to a magnetizing field of 1 kilogauss for 1 min. and after removal of this external magnetic field following examination to be carried out for the acceptance.

F-2 EXAMINATION AND ACCEPTANCE

F-2.1 For Inks and Wet Baths

A thoroughly demagnetized piece of soft iron shall be dipped into the ink/bath sample and the excess ink/bath is shaken off. There shall be no particle accumulation on the soft iron piece.

F-2.2 For Dry Powders

A thoroughly demagnetized piece of soft iron shall be brought very near to the powder sample within 1 mm. There shall be no particle accumulation on the soft iron piece.

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